

CLAIMS

What is claimed is:

1. A ferrule comprising:
a body, peripherally dimensioned for receipt within a commercially available fiber optic connector,
the periphery of the body defining a cavity;
the body having a forward portion comprising a front side and a rear side;
the front side defining a face of the ferrule,
the rear side defining an inner surface of the cavity,
the forward portion having a large format array of fiber holes, each of the fiber holes in the array extending between the front side and the rear side and being sized to accept an optical fiber inserted therein, and
the forward portion having a thickness, T, less than 3000 microns but at least a minimum thickness sufficient to support optical fibers inserted into the fiber holes.
2. The ferrule of claim 1 wherein T is between about 250 microns and the minimum thickness.
3. The ferrule of claim 1 wherein T is about 250 microns.
4. The ferrule of claim 1 wherein T is about 150 microns.

5. The ferrule of claim 1 wherein T is between the less than 3000 microns and about 150 microns.
6. The ferrule of claim 1 wherein T is between about 1000 microns and about 150 microns.
7. The ferrule of claim 1 wherein T is between about 1000 microns and the minimum thickness.
8. The ferrule of claim 1 wherein T is between about 500 microns and the minimum thickness.
9. The ferrule of claim 1 wherein T is between about 150 microns and the minimum thickness.
10. The ferrule of claim 1 wherein T is between the less than 3000 microns and about 1000 microns.
11. The ferrule of claim 1 wherein the large format array of fiber holes is arranged in a rectangular array.
12. The ferrule of claim 11 wherein the large format array of fiber holes comprises at least 9 holes.

13. The ferrule of claim 11 wherein the large format array of fiber holes comprises at least 3 rows of at least 3 holes per row.

14. The ferrule of claim 1 wherein the large format array of fiber holes comprises at least 32 holes.

15. The ferrule of claim 14 wherein the large format array of fiber holes comprises at least three rows.

16. The ferrule of claim 1 wherein the large format array of fiber holes comprises at least 60 holes.

17. The ferrule of claim 16 wherein the large format array of fiber holes comprises multiple rows of at least of 12 holes per row.

18. The ferrule of claim 16 wherein the large format array of fiber holes comprises at least 5 rows of at least 12 holes per row.

19. The ferrule of claim 1 wherein the large format array of fiber holes comprises at least 72 holes.

20. The ferrule of claim 19 wherein the large format array of fiber holes comprises rows of at least a multiple of 6 holes per row.

21. The ferrule of claim 19 wherein the large format array of fiber holes comprises at least 6 rows of holes.

22. The ferrule of claim 1 wherein the body comprises a polymer.

23. The ferrule of claim 22 wherein the polymer is a cured epoxy.

24. The ferrule of claim 23 wherein the cured epoxy is a glass filled epoxy.

25. The ferrule of claim 22 wherein the polymer is a thermoplastic.

26. The ferrule of claim 22 wherein the polymer is a polyimide.

27. The ferrule of claim 22 wherein the polymer is a polymer derived from a curable resin.

28. The ferrule of claim 27 wherein the curable resin is a thermoset resin.

29. The ferrule of claim 27 wherein the curable resin is UV curable.

30. The ferrule of claim 27 wherein the curable resin is electron beam curable.
31. The ferrule of claim 1 wherein the formed body comprises a metal.
32. The ferrule of claim 1 wherein the formed body comprises a ceramic.
33. The ferrule of claim 1 wherein the size of a fiber hole in the large format array, at the face of the ferrule, is slightly larger than a cross sectional area of a multimode optical fiber.
34. The ferrule of claim 33 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of about 250 microns.
35. The ferrule of claim 33 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of less than 250 microns.
36. The ferrule of claim 35 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of about 125 microns.
37. The ferrule of claim 35 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of less than about 125 microns.

38. The ferrule of claim 33 wherein a narrowest dimension of a fiber hole in the large format array, at the face of the ferrule, is slightly larger than a diameter of an optical fiber cladding.

39. The ferrule of claim 38 wherein the narrowest dimension is slightly larger than 70 microns.

40. The ferrule of claim 38 wherein the fiber hole in the large format array, at the face of the ferrule, has a non-circular cross sectional shape.

41. The ferrule of claim 40 wherein the shape is substantially oval.

42. The ferrule of claim 40 wherein the shape is substantially square.

43. The ferrule of claim 40 wherein the shape is substantially rectangular.

44. The ferrule of claim 1 wherein the size of a fiber hole in the large format array is slightly larger than a cross sectional area of a single mode optical fiber.

45. The ferrule of claim 44 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of about 250 microns.

46. The ferrule of claim 44 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of less than about 250 microns.

47. The ferrule of claim 46 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of about 125 microns.

48. The ferrule of claim 46 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of less than about 125 microns.

49. The ferrule of claim 46 wherein the fiber holes in the large format array, at the face of the ferrule, are on a pitch of between about 125 microns and about 25 microns.

50. The ferrule of claim 44 wherein a narrowest dimension of a fiber hole in the large format array, at the face of the ferrule, is slightly larger than a diameter of an optical fiber cladding.

51. The ferrule of claim 50 wherein the fiber hole in the large format array, at the face of the ferrule, has a non-circular cross sectional shape.

52. The ferrule of claim 51 wherein the shape is substantially oval.

53. The ferrule of claim 51 wherein the shape is substantially square.

54. The ferrule of claim 51 wherein the shape is substantially rectangular.
55. The ferrule of claim 50 wherein the narrowest dimension is slightly larger than 125 microns.
56. The ferrule of claim 50 wherein the narrowest dimension is slightly larger than 17 microns.
57. The ferrule of claim 50 wherein the narrowest dimension is between slightly larger than 125 microns and about 17 microns.
58. The ferrule of claim 1 wherein the commercial standard fiber optic connector comprises one of an MTP, MPX, MPO or SMC type connector.
59. The ferrule of claim 1 wherein the commercial standard fiber optic connector comprises one of an ST, LC or MT-RJ-type connector.
60. The ferrule of claim 1 wherein the body comprises a single homogeneous piece.
61. The ferrule of claim 1 wherein the body comprises at least two pieces and wherein one of the at least two pieces includes the forward portion.

62. The ferrule of claim 1 wherein the face and the inner surface are substantially parallel to each other.

63. The ferrule of claim 1 wherein the inner surface is at an angle relative to the face.

64. The ferrule of claim 1 wherein at least one of the face or the inner surface are curved.

65. The ferrule of claim 1 wherein the fiber holes are substantially cylindrical along their length.

66. The ferrule of claim 1 wherein the fiber holes are tapered along their entire length.

67. The ferrule of claim 1 wherein the fiber holes are tapered along a part of their length.

68. An optical connector comprising:
a connector housing;
a ferrule sized for containment within the connector housing; and
multiple optical fibers within the ferrule, the ferrule comprising a formed body lacking guide grooves and having a leading end including multiple holes extending through the

leading end to a face surface, the holes being spaced from each other in a regular arrangement by a predetermined pitch, each of the multiple holes containing one of the multiple optical fibers, the leading end having a thickness of between a minimum structural thickness and under 3000 microns.

69. The ferrule of claim 68 wherein the thickness is between about 250 microns and the minimum thickness.

70. The ferrule of claim 68 wherein the thickness is between about 1000 microns and the minimum thickness.

71. The ferrule of claim 68 wherein the thickness is between about 500 microns and the minimum thickness.

72. The ferrule of claim 68 wherein the thickness is between about 150 microns and the minimum thickness.

73. The ferrule of claim 68 wherein the multiple holes are arranged in a rectangular array.

74. The ferrule of claim 73 wherein the multiple holes comprise at least 9 holes.

75. The ferrule of claim 73 wherein the multiple holes comprise at least 3 rows of at least 3 holes per row.
76. The ferrule of claim 68 wherein the multiple holes comprise at least 48 holes.
77. The ferrule of claim 76 wherein the multiple holes comprise multiple rows of at least of 12 holes per row.
78. The ferrule of claim 76 wherein the multiple holes comprise at least 5 rows of at least 12 holes per row.
79. The ferrule of claim 68 wherein the multiple holes comprise at least 72 holes.
80. The ferrule of claim 79 wherein the multiple holes comprise rows of at least a multiple of 6 holes per row.
81. The ferrule of claim 79 wherein the multiple holes comprise at least 6 rows.
82. The ferrule of claim 68 wherein the formed body comprises a polymer.

- 83. The ferrule of claim 82 wherein the polymer is a cured epoxy.
- 84. The ferrule of claim 83 wherein the cured epoxy is a glass filled epoxy.
- 85. The ferrule of claim 82 wherein the polymer is a thermoplastic.
- 86. The ferrule of claim 82 wherein the polymer is a polyimide.
- 87. The ferrule of claim 82 wherein the polymer is a polymer derived from a curable resin.
- 88. The ferrule of claim 87 wherein the curable resin is a thermoset resin.
- 89. The ferrule of claim 87 wherein the curable resin is UV curable.
- 90. The ferrule of claim 87 wherein the curable resin is electron beam curable.
- 91. The ferrule of claim 68 wherein the formed body comprises a metal.
- 92. The ferrule of claim 68 wherein the formed body comprises a ceramic.

93. The ferrule of claim 68 wherein the multiple optical fibers are multimode optical fibers and the holes are each slightly larger than a cross sectional area of a multimode optical fiber contained therein.

94. The ferrule of claim 93 wherein the predetermined pitch is about 250 microns.

95. The ferrule of claim 93 wherein the predetermined pitch is less than 250 microns.

96. The ferrule of claim 95 wherein the predetermined pitch is about 125 microns.

97. The ferrule of claim 95 wherein the predetermined pitch is less than about 125 microns.

98. The ferrule of claim 68 wherein the multiple optical fibers are single mode optical fibers and the holes are each slightly larger than a cross sectional area of a single mode optical fiber contained therein.

99. The ferrule of claim 98 wherein the holes are on a pitch of about 250 microns.

100. The ferrule of claim 98 wherein the holes are on a pitch of less than about 250 microns.
101. The ferrule of claim 100 wherein the holes are on a pitch of about 125 microns.
102. The ferrule of claim 100 wherein the holes are on a pitch of less than about 125 microns.
103. The ferrule of claim 100 wherein the holes are on a pitch of between about 125 microns and 25 microns.
104. The ferrule of claim 68 wherein the commercial standard fiber optic connector comprises one of an MTP, MPX, MPO or SMC type connector.
105. The ferrule of claim 68 wherein the commercial standard fiber optic connector comprises one of an ST, LC or MT-RJ-type connector.
106. The ferrule of claim 68 wherein the formed body further includes an inner surface and wherein the face surface and the inner surface are substantially parallel to each other.
107. The ferrule of claim 68 wherein the formed body further includes an inner surface at an angle relative to the face surface.

108. The ferrule of claim 68 wherein the formed body further includes an inner surface and at least one of the face surface or the inner surface are curved.

109. The ferrule of claim 68 wherein the multiple holes are substantially cylindrical along their length.

110. The ferrule of claim 68 wherein the multiple holes are tapered along their entire length.

111. The ferrule of claim 68 wherein the multiple holes are tapered along a part of their length.

112. A fiber optic cable assembly comprising:
a bundle of multiple individual optical fibers having a first end and a second end and a length in between; and
a connector located on at least one of the first or second ends, wherein the connector includes the ferrule of one of claims 1 through 67, and wherein the individual fibers of the bundle of the at least one end are each constrained within individual fiber holes in the large format array.